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Role of IOT in introducing Smart Agriculture

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Abstract - *Internet of Things (IoT) refers to the implementable Machine-to-Machine (M2M) communications which is a crucial component of recent growth in the digital market. In this paper, important agricultural applications are highlighted, and applicability of IoT towards improved performance and productivity are discussed. Characteristics of IoT are presented. Usable hard ware platforms, wireless communication technology standards, and IoT cloud services for agricultural applications are analyzed. Various sensor based IoT systems also listed in this paper. Author also reviewed and studied the existing IoT deployments in multiple domains. IoT sensors may provide information about agriculture fields and then act on it based on user input. The development of a system that can monitor temperature, level of water, wetness, and even movement if any occurs in the field that may kill the crops in an agricultural field using sensors utilizing the Arduino UNO board is termed as smart agriculture. The goal is to integrate developing technologies, such as the Internet of Things (IoT) and smart agriculture with automation. After the hardware has been built to meet changing needs and technologies, the software must be updated. The modified hardware is referred to as a new software version. This new version must be checked to ensure that the modifications are correct. It also won't introduce faults in other parts of the software. This is required because changing one component of the hardware can have unintended consequences in other parts of the hardware.*

Key Words: Internet of things(IOT), Smart Agriculture using IOT, Arduino, Soil Moisture Sensor, Water Level Sensor.

1. INTRODUCTION

The Internet of Things (IoT) is expanding, growing, and getting more popular by the day. In today's world, approximately 5 billion things are connected to the internet. Around 50 billion things are expected to be connected to the internet by 2020, according to estimates. IoT is opening up a world of possibilities for new applications, which are now being employed in a variety of areas, including intelligent home monitoring systems, product supply chain management, precision agriculture, and much more.

Using RFID (Radio Frequency Identification), Wireless Sensor Network (WSN), or other methods, everything in the Internet of Things is reachable, recognized, readable, and locatable over the internet. Precision agriculture, product supply chain management, Smart Grid, environmental monitoring, cloud computing, and other sectors are all using the Internet of Things concept. IoT is gaining much importance these days as every object in the network will become a computer. The idea of IoT has become successful due to the invention of recent technologies like sensors, RFID and WSN.

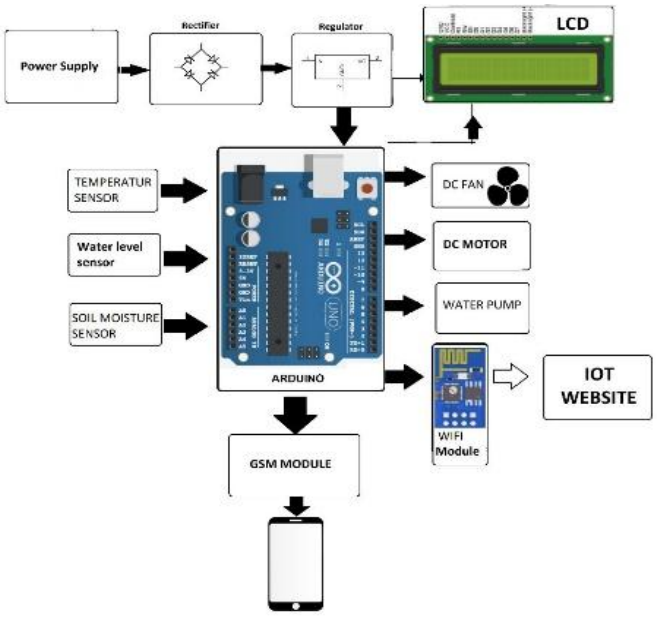

Fig.1 : Block diagram of IoT applications

Smart farming is a farming management concept that employs contemporary technologies to boost the quantity and quality of agricultural products. GPS, soil scanning, data management, and Internet of things technologies are available to farmers in the twenty-first century. The purpose of smart agriculture research is to develop a farm management decision-making assistance system.

From crop planting and watering to health and harvesting, smart farming considers it important to address the concerns of population expansion, climate change, and labour, all of which have received a lot of technological attention.

A system is constructed for monitoring the agricultural field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating irrigation in IOT-based smart agriculture.

IOT (Internet of Things) refers to the use of sensors, cameras, and other devices to turn every element and action in farming into data in the context of agriculture.

Because smart agriculture would greatly minimize modern agriculture's negative environmental externalities, we need it to spread and evolve from where it is currently. Smart cities use Internet of Things (IOT) equipment such connected sensors, lighting, and meters to collect and analyze data. Cities then use this information to improve infrastructure, public utilities, and other services, among other things. Farmers struggle to grasp technical concepts and applications of technology, and it is also an expensive endeavor.

2. LITERATURE SURVEY

An Effective Method for Crop Monitoring Using Wireless Sensor Network by N. Shakthipriya (2014): In India about 70% of population depends upon farming and one third of the national capital comes from farming. The highlighting features of this concept includes smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, weather forecasting, water management, canal controlling in both automatic and manual modes and all these data are stored and displayed in a mobile sensors, Wireless Fidelity etc.

Multidisciplinary Model for Smart Agriculture using IoT by Hemlata Channe, Sukhesh Kothari and Dipali Kadam (2015): Climate changes and rainfall has been regular over the past decade. Due to this, climate-smart methods called as smart agriculture is adopted by many Indian farmers. Smart agriculture is an automated and directed information technology implemented with the IoT (Internet of Things). IoT is developing rapidly and widely applied in all wireless environments. The sensor technology and wireless networks integration of IoT technology has been studied and review. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) is done.

Automatic Control of Agricultural Pumps based on Soil Moisture Sensing by Beza Negash Getu, Hussian A. Attia (2015): Water is always a needy part of everyone's life. Due to environmental situation, water management and conservation will play a vital for human survivals. Recently, there were huge needs for consumer based humanitarian projects that could be rapidly developed using Internet of Things (IoT). This proposes an IoT based water monitoring system that measures water level in real time. The prototypes are based on the level of the water can be an important parameter when it comes to the flood especially in disaster areas.

A Control System in an intelligent farming by using Arduino technology by Putjaika and Narayut (2016): Even now different developing countries using the traditional ways and backward techniques in agriculture sector. A little technological advancement has increased the production efficiency significantly. And to increase the productivity the inventive approach is introduced. Smart farming with Internet of Things (IoT) has been designed. By developing a motor vehicle which can be operated on both automatic and manual modes which can be used for various agriculture activities like cutting, spraying, and weeding etc. The controller will monitor the temperature, humidity, soil fertility, and water management to the field. By using green energy and smart technology the agriculture sector will find a better way to increase the productivity.

3. APPLICATIONS OF IOT IN SMART AGRICULTURE

Precision agriculture, whose design incorporates IoT techniques for urban agriculture and precision agronomy in smart cities, is one of the most common uses of IoT technologies in agriculture.

Smart cities are typically built on software-defined networks (SDN) and cyber-physical systems. Other possible uses for the Agricultural drones, which are very inexpensive drones with advanced technology, are an example of IoT.

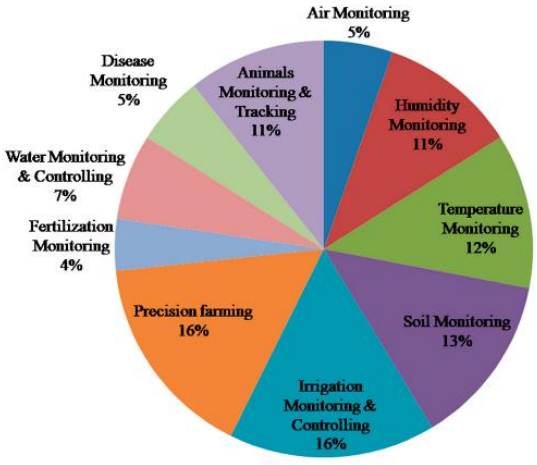

Fig.2 : Applications of IoT in various sectors of smart farming

Farmers will be able to use sensors to boost yields and prevent crop damage, among other things something else Intelligent greenhouses are another area where IoT can be used. Hydroponic and small-scale aquaponic systems are included. Intelligent Greenhouses are becoming more common in urban areas as they allow for better monitoring.

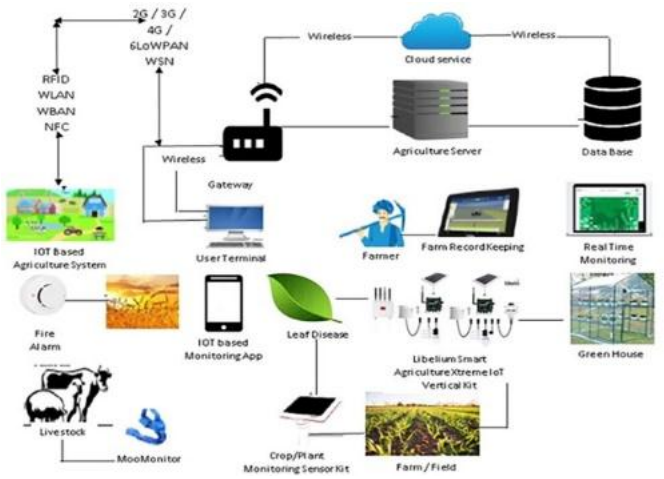

Fig.3 : Applications of IoT based agriculture systems

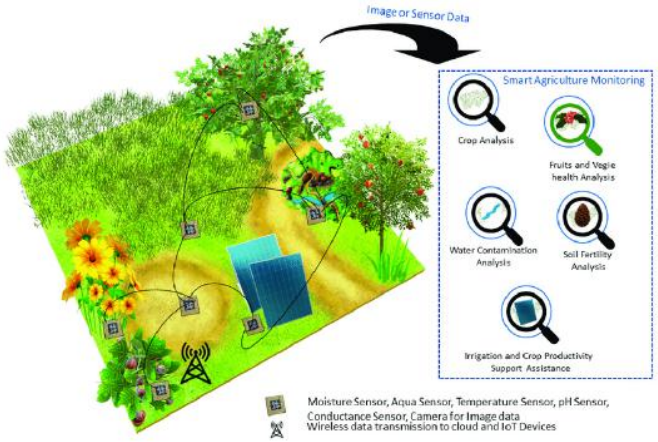

Fig.4 : Wireless data transmission to cloud and IoT devices.

Numerous nutrient solution parameters, as well as to promote growth, production, and quality and the standard of plants.

These enhancements provide a substantial contribution to the achievement of the goal. infrastructures in smart cities that allow for automation, optimization, and improvement Precision agronomy and urban agriculture another area where IoT technologies are being used is in healthcare.

Vertical agriculture is used, which permits soil moisture and water to be controlled material through computers or mobile devices like tablets and smartphones. Finally, there are applications that mix Internet of Things (IoT) and Artificial Intelligence (AI) such as Malthouse , an Artificial Intelligence system that allows precision farming and food manufacture to prescribe configurations and timetables areas.

4. IOT-BASED DEVICES USED IN AGRICULTURE

Many businesses and marketplaces throughout the world have embraced IoT-based devices. Agriculture is one of these businesses, which benefits from IoT technologies in a variety of ways. In Indiana, for example, LoRa is a frequently utilized network radio because long range, low power consumption, and low cost are just a few of its benefits a financial investment. Another example of IoT-based device application is the utilization of cameras to check the quality of food.

There are, on the other hand, techniques that mix cloud computing and wireless sensor networks to provide a comprehensive solution Agriculture-as-a-Service (AaaS) is a service that allows you to manage agricultural data.

Using Big Data technologies The Phytec firm, for example, provides A Systematic Literature Review of IoT Applications in Agriculture. Plan IoT is a platform for automatically detecting changes in plant status, analysing data, and making recommendations.

5. IOT-BASED SOFTWARE APPLICATIONS USED IN AGRICULTURE

IoT-based solutions have been effectively implemented in a variety of situations. As a result, various companies are investing in IoT-based farm software development. There are numerous software programmes available on the market nowadays centred on assisting various farming operations AG-IoT , for example, is a unmanned aerial vehicle that searches for and assists IoT-enabled devices to construct data transmission groups on the ground Agro 4.0.

On the other hand, High-performance computing algorithms, a sensor network, and connectivity are all implemented to process enormous amounts of data using mobile devices, cloud computing, and analytical methods large amounts of data and provide decision-making aids. Agro-Tech is a company that produces, sells, and distributes agricultural technology and updates data collected from various sensors in a certain area of the world crop. Furthermore, this programme enables farmers to access this information aiming to monitor their harvest Malthouse is an Artificial Intelligence system that enables for the prescription of medications precise farming and food manufacturing configurations and schedules.

6. BENEFITS OF IOT IN AGRICULTURE

The major advantages of IoT in agriculture are described below:

• Using hardware and software to support community agriculture in both urban and rural regions enormous volumes of data and software resources.

• Food production may be traced logistically and qualitatively, lowering costs, reducing the waste of inputs through decision-making based on real-time data.

• Creation of agricultural business models that allow a direct link with the consumer to be established.

• Crop surveillance, which provides for cost savings as well as the prevention of machinery theft.

• Automatic watering systems that adjust based on temperature, humidity, and other factors sensors, as well as soil moisture readings derived by sensors.

• Automatic environmental parameter gathering using sensor networks for more analysis and processing.

• Assisting with decisions systems that analyze large amounts of data to improve operational efficiency and productivity.

7. CONCLUSIONS

IoT technology enable efficient remote crop monitoring by providing information on climate, humidity, temperature, and soil fertility, among other things. Farmers may know the state of their crop at any time thanks to these technology any time and from any location. Wireless sensor networks, on the other hand, provide for control the farm's environment, as well as automate certain processes.

For instance, some wireless cameras are used in several of the experiments examined in this paper to determine crop status in the present moment Drones have also been used in other research to assist with precise tasks.

Smartphones are being used in agriculture to keep farmers updated about the present state of their crops wireless sensor networks and cloud computing are being used to develop agricultural solutions, mobile apps, computing, and middleware systems.

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BIOGRAPHIES

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